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Nicotine-Induced Reflex Coronary Vasodilation.

The goal of this study is to delineate the mechanism by which intravenous nicotine produces coronary vasodilation. Specifically, it is proposed to: (1) demonstrate that the nicotine-induced coronary vasodilation is reflex in nature and (2) establish the afferent and efferent pathways involved in this response. It is know that nicotine stimulates chemoreceptors, which in turn elicit hyperventilation. It is proposed that the resultant hyperventilation, through stimulation of the lung inflation reflex, is responsible for the coronary vasodilation.

Several approaches will be made to this problem. The extent to which intravenous nicotine increases coronary blood flow and reduces coronary vascular resistance will be determined. Whether the nicotine-induced coronary vasodilation is primary or secondary to changes in myocardial O_2 requirements will be examined by comparing effects of intravenous and intracarotid nicotine on coronary dynamics (1) when the heart is in spontaneous rhythm, (2) with heart rate controlled by pacing, and (3) after inotropic effects are blocked with propranol, 1 mg/kg. In addition, arterial and coronary sinus oxygen will be measured to determine if coronary A-VO_2 difference narrows.

The efferent autonomic pathways involved in the changes in heart rate, total peripheral resistance and resistances in the coronary, mesenteric, renal and iliac beds will be determined by selective and combined blockades of beta adrenergic receptors with propranolol, 1 mg/kg, alpha adrenergic receptors with phentolamine, 1 mg/kg, and cholinergic receptors with atropine, 0.2 mg/kg.

The extent to which nicotine-induced circulatory changes, and the induced coronary dilatation in particular, are due to nicotine's chemoreceptor stimulating action will be determined by injecting nicotine through catheters previously implanted in the common carotid artery just proximal to the carotid sinus.

The extent to which hyperventilation, through stimulation of pulmonary stretch receptors, resulting from nicotine's stimulation of chemoreceptors, regulates the circulation and specifically causes coronary dilation will also be examined by hyperinflating the lungs in conscious animals. The effects of pulmonary hyperinflation on heart rate, arterial pressure, myocardial contractility, cardiac output, total peripheral resistance and blood flow and resistance in the coronary, mesenteric, renal and iliac beds will be examined.

Activation Date: July 1, 1974

Current Grant Level: $20,000.

10050549

Source: https://www.industrydocuments.ucsf.edu/docs/jzmk0000